SECTION B: REMARKS

I. INTRODUCTION

The present communication is responsive to the Office Action mailed August 19, 2004 in relation to the above-identified patent application. Claims 1-21 remain in prosecution. Reconsideration is respectfully requested.

II. CLAIM REJECTIONS UNDER 35 U.S.C. §102(b) BY SAKURAI ET AL. 6,201,825

In the August 19, 2004 Office Action, Claims 1-5, 7, 9, 12-16 and 18 were rejected under 35 U.S.C. §102(b) as being anticipated by Sakurai et al. '825.

Sakurai et al. discloses a surface emitting semiconductor laser device having a long life time and uniform light output. A periphery of an upper source and a side surface of a mesa structure is covered with silicon oxide nitride film 34 as an inorganic insulating film, the mesa structure comprising a lower DBR 16 of a first conduct type formed on a first primary surface of an n-type GaAs substrate 12, having formed thereon an active region 24, an upper DBR 26 containing an AlAs layer 32 as the lowermost layer and a p-type GaAs contact layer 28. The Sakurai et al. laser emits light output vertically in relation to the Bragg reflections. Therefore the Sakurai et al. mirror provides circular symmetry and acts solely as a reflector.

<u>Applicant's invention has wave guiding channels</u>

Applicant's claimed apparatus is directed to a transverse Bragg resonance wavelength comprising a wave guiding channel that transmits and guides the

propagation of optical energy. The wave guiding channels control the direction of the optical energy and controls the propagation of the energy. The wave guide comprises fabricating a planar wave guiding channel and sandwiching the planar wave guiding channel on two opposing sides by a periodic index media. The function of a wave guide is to restrict the three dimensional "free space" propagation of the electromagnetic wave to a single dimension. The wave travels along the guide without greatly attenuating as it goes.

Sakurai et al. does not disclose a wave guiding channel that can guide the direction of or the propagation of optical energy. Sakurai et al. utilizes a Bragg mirror for <u>reflecting</u> energy in a circular pattern, not as a <u>guiding channel</u>.

<u>Applicant provides gain by pumping the transverse Bragg resonance wavelength</u>

Furthermore, Applicant's invention provides for two periodic index media on at least two opposing sides of the channel, and an electrical or optical means for providing gain in the periodic index media by <u>pumping</u> the transverse Bragg resonance wavelength so that <u>upon each reflection the wave grows a bit and its intensity increases</u>. The optical confinement in the Applicant's invention is based on "pumping", i.e., activating the periodic Bragg media so that it is capable of <u>amplifying</u> light. The pumping mechanism shown schematically in the perspective view of Fig. 5b is an electric current in the case of a semiconducting medium or an optical beam of the proper wavelength, usually shorter than that amplified by the medium, either of which is used to excite atoms of the periodic medium so as to create an amplifying inverted atomic population.

The periodic index media comprises a periodic lattice of regions having an index of refraction distance from the channel, such as an array of transverse holes defined in a planar semiconductor substrate in which the channel is also defined, or an array of longitudinal holes defined in a cylindrical semiconductor fiber in which the channel is also longitudinally defined.

Additionally, the present invention emits light output horizontally to the mirror planes and functions as an amplifier. The Applicant's invention has rectangular symmetry, and does not act solely as a reflector.

As is disclosed beginning on page 3, line 19:

"....the invention is defined as a method of providing an active transverse Bragg resonance wave guide comprising fabricating a planar waveguiding channel and sandwiching the planar waveguiding channel on two opposing sides by a periodic index media, and providing gain to the periodic index media, or fabricating a cylindrical waveguiding channel and surrounding the cylindrical waveguiding channel by a periodic index media, and providing gain to the periodic index media. The periodic index media can be electrically or optically pumped to provide gain.

In the illustrated embodiment the light wave is propagated at a detuned frequency given by $k_0 = (1 + v)\ \pi /b$ where k_0 is the modal wave number of the propagated light, v is the frequency, and b is the transverse periodicity of the periodic index media.

The semiconductor optical device is operated in a mode which has a gain enhancement, η, due to an increase of a gain constant, β_I, of the propagating

wave over the gain constant of a bulk dielectric and a substantial electric field content outside the channel leading to a larger modal cross-sectional area, and higher output power."

Further, disclosed starting on Page 7, line 6:

"In the top diagrammatic plan view of Fig. 6 we show another embodiment of a planar transverse Bragg wave guide 14 in which the periodicity is achieved by forming or drilling holes 16 into the two-dimensional guiding layer 18. A two dimensional wave guiding structure is provided which is comprised of a guiding channel of width W, a core, between two semi-infinite arrays of air holes 16 in a periodic pattern, e.g. a triangular lattice acting as a cladding. Shown in the core or region 22 of Fig. 6 are two in-plane k vectors of the plane waves that comprise the wave guide mode. The mode can be visualized as a wave, represented by the arrows 20, zigzagging down the channel of region 22 and Bragg reflected at the interface with region 24. If region 24 on both or one side is pumped, then upon each reflection the wave grows a bit and its intensity increases along the Z direction, which in Fig. 6 is the direction of wave propagation, i.e., we have an amplifier."

As shown in Fig. 7, using a current injected semiconductor laser material N type InP cladding 28 is formed on multiple quantum well regions 30 disposed on a p-type InP substrate into which a plurality of longitudinal trenches 32 have been formed and filled by an adjacent InGaAs layer 34, which is then finished with a-type InP cladding layer 36. The voltage pumped through the electrodes emits enhanced optical

energy. The advantages of such an amplifier include, but are not limited to,:

(1) The wave incident on the interface of the wave guide and the surrounding material is not reflected simply at the interface. It penetrates a considerable distance which may exceed the channel width W by a considerable factor (> 1). It can thus "milk" a large volume of amplifying medium which results in gain per unit length, in the direction, far in excess of what is possible in conventional based amplifiers, and

(2) Higher order modes are discouraged by the need to satisfy the Bragg condition ($k_{transverse}\, b = \pi$). Otherwise the reflectivity and gain diminish.

Sakurai et al. discloses applying an electric current between the n-type electrode 30 and the p-type electrode 36 of the device to conduct laser oscillation. Sakurai et al. discloses that the output is unchanged and an extremely stable normal radiation device is obtained. Whereas, the Applicant's optical device is operated in a mode which has a gain enhancement, η, due to an increase of a gain constant, β_I, of the propagating wave over the gain constant of a bulk dielectric and a substantial electric field content outside the channel leading to a larger modal cross-sectional area, and higher output power.

Sakurai et al. does not disclose a wave guiding channel that transmits optical energy and guides the direction of the propagating wave. Nor does Sakurei et al. disclose pumping the transverse Bragg resonance wave guide so that upon each reflection, the wave intensity increases, as Applicant claims in Claim 1.

Applicant respectfully asserts that independent Claims 1, 12, 16 and 17 are patentable both for their cooperation of structure and for the novel amended claim language. Further since Claims 2-5, 7 and 9 depend from Claim 1, and Claims 13-15 and 18-21 depend from Claim 12, these claims are likewise allowable both for their dependency and for the novel additional limitations recited therein.

SECTION C: SUMMARY

It is respectfully submitted that all of the claims are in condition for allowance. Applicant respectfully requests that the Examiner telephone the undersigned attorney if it appears that a telephone conference would facilitate allowance of the application.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on

~~November 15, 2004~~ November 16, 2004

by: Mike Navarro

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Signature

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